7. Beyond Cyberspace

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Introduction

What will happen when information technology (IT) is ubiquitous--when cyberspace permeates social space? What will society be like when IT becomes part of the background rather than a locus of emerging foreground trends? The charge to this breakout group was to scope and explore the territory beyond cyberspace as we think of it today.

Guiding Themes

First, the group noted that reaching beyond cyberspace probably has to do with grasping for what would usually be thought of in today's time frame as "secondary effects" or "unintended consequences." That is, leading-edge technologies often have what seem like unexpected by-products that later turn out to be major outcomes as these technologies become ubiquitous and converge in varied ways with older technologies.

Next, in the view of the group, such unintended consequences usually have more to do with human practices than with the technologies per se. It is how humans use the technologies that produce the surprises. Further, such surprises can dominate the intended consequences; in fact, they may be independent of or even opposite in effect to the intended outcomes.

Third, the group recognized that both human practices and technologies are contextualized. That is, they are situated in institutional realms (e.g., work, education, leisure) with embedded social norms, legal codes, shared histories, and hosts of more specific mores. These institutional factors are not easily changed and limit the pace and extent of the information revolution.

Domains to Explore

Given the role of institutions in providing the contexts within which human practices interact with and shape the outcomes of new technologies in use, the group decided to organize its Beyond Cyberspace explorations around selected institutional domains within which these outcomes will be manifest. Although a number of promising domains were discussed (including, for example, entertainment, health care, transportation, and other revolutions), the subset of four listed below were chosen for more detailed investigation:

- work
- political process
- education
- crime.

These domains clearly represent permanent--or at least semi-permanent--areas of human concern that will be changed by but will not disappear because of the information revolution. Moreover, each is associated with one or more institutions that involve varied norms, legal codes, situated practices, and so on. Entire professions have been engendered to maintain the functioning of these institutions in society. And each of the domains is susceptible to change and rebuilding by "breakdowns," where old institutionalized structures and behaviors become dysfunctional in the face of new threats or opportunities which they are ill designed to handle and must be replaced. When such sources of breakdown are identified, one participant suggested, it will be worth asking "Who will be winners and who will be losers in the new institutional environment?" As a general rule, the group speculated, when institutions change in response to the information revolution, those who formerly controlled information will turn out to be the new losers.

Among the many questions posed by the conference conveners to breakout groups, therefore, the Beyond Cyberspace group chose to treat possible institutional conflicts, tensions and impediments to the information revolution as an analytic probe for getting at the consequences--both intended and unintended--of ubiquitous IT. For instance, as the group chair noted, "Institutions change slowly. Internet time is fast. This disparity breeds tensions."

Assumptions

The group did not undertake a systematic exercise to identify the key assumptions on which the likely accuracy of its views of the world Beyond Cyberspace would depend (departing from the conveners' charge). However,

from time to time in its deliberations, some recurring assumptions surfaced. Noteworthy among them are the following.

First, it is assumed that knowledge work will constitute an increasing proportion of work in the long term future. This trend is already evident in the developed world; it will continue there and will emerge as well in less developed parts of the world over time.

Second, it is believed that the "first world" will lead the production of IT for the foreseeable future. Again, this is true now and is expected to remain true even if other regions of the world catch up with the developed world in IT consumption.

A third and probably related assumption is that the economy of the first world will not collapse, although moderate fluctuations should not be ruled out.

Finally, although the populations of the developed world are becoming older (a demographic trend already in evidence), an increasing proportion of major decisions affecting the IT industry will be made by youth. "Kids rule," as one participant put it--and he was referring not just to IT consumption but especially to IT production. Young entrepreneurs will continue to compete successfully in the IT marketplace in increasing numbers, particularly as e-commerce lowers entry barriers and as the old top-down large-scale R&D model of successful innovation is replaced by myriad small-scale fast-emerging ventures.

The remainder of this breakout group report summarizes Beyond Cyberspace discussions within the four major domains of interest listed above. Among them, the domain of work received greatest attention.

Work

The lead-off question in this domain--"what/where/when is work?"-- generated varied issues that deserved more attention than the group had time to give them. For instance, will work go to where the people are, or will people go where the work is, or both? Such an issue calls attention both to the nature of knowledge work and to roles for migration (physical and virtual) as well as for telecommuting. The group's discussion of this broad arena is presented under four interrelated topic areas below.

The Nature of Work

Manual labor, as noted in the assumptions, is increasingly being transformed into knowledge work. Echoing a viewpoint sounded earlier in the conference, the group chair suggested that knowledge work could best be construed as work accomplished through systems of communicative exchanges among workers; such systems rely, for example, on the making of requests or offers, the fulfilling of promises, and other elements of performative discourse.

On the one hand, knowledge work is far less easy to observe than physical labor. On the other hand, in IT-based work environments, computer software can be deployed to record and manage the schedule of commitments and completions; they can also measure and track many other work parameters. Workflow systems already carry out such functions in the manufacturing sector and are now emerging in the sphere of knowledge work.

In some organizations, the application of workflow systems to knowledge work has felt like Taylorization and surveillance; and knowledge workers have reacted quite negatively to what they perceive as monitoring and control. In other organizations, by contrast, such technology has appeared to improve the management of knowledge work and to improve the organization's perceived reliability and credibility.

The result probably depends in large measure on how systems for managing knowledge work are implemented. Recent improvements in workflow technology, for instance, are expected to permit such systems to be more user guided (e.g., allowing workers to control or modify the flow of work based on feedback from the workflow system) and more flexible (e.g., offering options for user over-rides of system behavior). In the meantime, according to one participant, "We've turned the Taylor model on its head. Knowledge workers know more than the managers do now, and knowledge workers have so much mobility that they control the viability of the corporation." If so, this result tends to corroborate the view (reported above) that those who formerly controlled information--in this instance, the managers--lose power, relatively speaking, in new IT-based knowledge work environments.

Collaborative Networks

Ubiquitous IT enables knowledge work to be distributed over networks among workers who may or may not be in the same physical environment or even in the same time zone. The advantages potentially yielded by arrangements for any-time any-place work, for instance, or by media that support rapidly

(re)configurable teams designed to meet unique task demands, have been well explored in other venues. NSF's "scientific collaboratory" construct is one example; the notion of "e-lance workers" who bid on individual knowledge-work tasks independently of any organizational base is another.

Many knowledge workers today accomplish at least some of their tasks using networks that support shared distributed activity. Getting Beyond Cyberspace in this area would require advances in the ability to componentize both software systems and knowledge-based jobs. Given componentization, it would be possible to issue bids for all kinds of work (including system development work but also any work that could be carried out remotely via a network); the main task left to the corporation itself would be to assemble the results as they came back from bidders. If someone figured out how to do a good job of componentizing software development, for example, jobs could be put out for bids one day and the new systems could be assembled the next day, assuming the components were available "off the shelf." The development of Linux and the calculation of the 9th Fermat number were cited as cases of successful collaborative work carried out by large widely-distributed groups.

Probing the unintended consequences of such an IT-enabled future led to a number of concerns. First, we do not yet know enough about the role of shared tacit knowledge and shared physical artifacts in colocated interdependent work to understand how to create equally viable shared contexts using distributed collaborative networks if this is indeed possible (group opinion was divided). In any case, at present the consequences of attempts to do without actual shared interaction contexts have generally been unpredictable but more negative than positive.

Second, if knowledge work could be parsed into individual tasks to be done on an any-time any-place basis, would the work become meaningless? Would workers become self-absorbed and socially disconnected or disempowered? Could it increase the value of nonmonetary rewards (e.g., peer recognition, or "coolness" earned for individual task virtuosity in software design)? One group member termed this phenomenon "radical individualism," noting it could also be an unintended consequence of moving to ubiquitous individualized distance learning in the education domain.

Third, we know little about the likely skill mix needed to drive and sustain collaborative network-based knowledge work. It might seem a safe bet to say that, at minimum, if such work environments were ubiquitous, there would be a huge and burgeoning demand for IT professionals (who are already in short supply in the United States). But not necessarily, according to one participant

who provided an analogy from the 1950s. At that time, given the rate of television diffusion, it would have seemed like a sure thing to predict the need for enormous increases in the number of TV repairmen by the end of the century. However, television technology advances (e.g., getting rid of moving parts, improving fault tolerance, providing diagnostic read-outs for users) essentially filled that need. The same might be true of the IT field in the future. If so, only a relatively small number of designers and engineers would be needed to push the state of the IT art.

Reorganization of Industries

The fluidity and flexibility of digital tools and objects, together with network-enabled opportunities for disintermediation, are expected to lead to the restructuring of many industry sectors. Two types of restructuring were underscored by the group.

One type stems from advances in networked digital media that will allow many new individuals and groups to become producers in the information economy and to use their own networks of distribution. These effects will be most visible in the near future in such areas as entertainment (e.g., film and music) and publishing (e.g., books, periodicals and news). Currently a small number of companies control most of the content and the delivery of mass media (because of vertical mergers such as the one between AOL and Time-Warner). In the future, disintermediation will enable contents to be provided online by varied producers, including large companies but also small groups and individuals; consumers will be able to select whatever content they prefer at times and places of their own choosing; and control of old delivery channels will no longer be a viable business. Such trends are emerging now in music and film (although progress in film is slower because of the demands it places on display devices). The publishing industry may go the same way.

Group members regard these trends as additional instances of new winners and losers, where those who profited from controlling information in the past end up on the losing side of the equation when IT becomes ubiquitous. There was speculation about the future of mass customization in entertainment and publishing (e.g., Could DirectTV replace Blockbuster? Could broadcasting disappear?). However, concerns were expressed about the potential unexpected consequences of the loss of shared experiences. What, for example, is the value of seeing the same movie? And what is the value of seeing the same movie together? In some ways, these questions parallel those raised about the value of shared actual work contexts above.

A second type of restructuring is predicated on the vision of significant disintermediation leading to the formation of new service brokering industries. In any business sectors characterized by fast-paced network-based transactions between large numbers of providers and customers (including entertainment and publishing but also financial markets, software components and distance learning), group members foresaw an emerging demand for trust brokers, identity brokers, branding consultants, aggregate brokers (covering whole subsectors, such as cars for sale), and the like. Finally, some dying industries may be resuscitated by global markets becoming widely accessible through pervasive networks (an example is the ability to make local crafts from artisans in less developed parts of the world available for inspection and purchase by customers in other other regions). It was acknowledged that this kind of restructuring of industries was being covered in greater depth by the Services breakout group; however, the Beyond Cyberspace group wanted to note the possibly surprising result that disintermediation generates the need for entirely new classes of intermediaries.

Migration

The discussion of migration was stimulated by one Beyond Cyberspace participant's remark that an unintended consequence of the previous revolution in the nature of work--the industrial revolution--was mass migration, with huge numbers of people moving to different places within and between nations. The information revolution, he argued, is doing the same--Singapore and Ireland, for instance, are massively recruiting bright young people for their IT-intensive industries. Large movements of people, in turn, will undoubtedly change the steady state of the world; but it is unclear what the new steady state of the Beyond Cyberspace world will look like.

In the earlier stages of the industrial revolution in the US, workers moved to where the work was. Later, US industries began to move some of their work offshore to where the workers were (e.g., through direct foreign investment or through outsourcing). Assuming the ubiquity of IT, the potential migration consequences of the information revolution are more complicated to envision because both physical and virtual migration could take place.

So far, the US is in the most favored position to take advantage of physical migration of workers for its IT industry (because of its relatively high quality of life and its well developed, densely interconnected IT structure). On the other hand, it would also be most vulnerable to the negative effects of physical migration (e.g., ethnic polarization). Earlier generations of geographic

migrants had to make trade-offs between assimilation of the new culture and the maintenance of national identity, with the direction of the choice contributing either to melting-pot integration or polarization. A globally wired economy, however, might reduce such tensions by allowing individuals to remain in regular contact with their own culture (e.g., through electronic communication with family members as well as access to media reflecting their own linguistic and social context) while moving to a new country to work. It is unclear whether assimilation would be seriously impaired by such options.

However, for countries interested in avoiding increased ethnic diversity at home, virtual migration might be the preferred future option for acquiring a growing IT workforce. Virtual migration, like outsourcing, could alleviate local tensions between old and new communities as well as resource allocation conflicts created by new demands and extant commitments of community services. It also might be preferred by workers themselves, since they could attain the desired jobs without having to leave their home countries. But virtual migration would not alleviate some significant sources of international tension, such as international resentments created by the virtual drawing off of talent or strains stimulated by increased international interdependencies (e.g., the US could have a direct economic interest in intervening to assure that India and Pakistan avoid war).

Last, group members identified two old issues that may take on new forms in the Beyond Cyberspace world. One focuses on knowledge workers whose rights and benefits in an environment of mobile, distributed, highly individualized yet globally-based tasks might be jeopardized and whose traditional sources of support might be weakened. Questions were raised about the impact of such IT-based revolutions in work on the effectiveness of labor organizers and labor unions as well as the enforceability of desirable codes of workers' rights.

The second old-but-new issue turns on global haves and have-nots. Not every technology is appropriate for every country at any given time. For example, even if the Internet and World Wide Web were ubiquitous today, not every country would be in a position to make effective use of such other high-tech capabilities as high resolution satellite imagery, and therefore may not be able to employ portions of its latent IT workforce interested in that specialty. As a result, its budding GIS specialists or image analysis software developers (or other technically gifted workers) could readily be lured away--virtually or actually--by work in another more developed country's firms, despite the home country's being heavily "wired." Thus the ubiquity of generic networked IT does not guarantee that the digital divide and the tensions associated it will

be overcome. Rather, they may just reappear in different digital arenas of the Beyond Cyberspace world.

Political Processes and Governance

It is critical, one Beyond Cyberspace participant said, to ask how the information revolution will affect political processes. Another group member responded that it would be entirely possible, in the ubiquitous networked IT world of the future, for new "virtual states" to arise that cross national boundaries, use only their own invented currencies, and bypass both national laws and international agreements related to taxation, import/export regulation, fair trade, and so on. Further, given dramatic differences in the pace of change between formally instituted bureaucratic procedures on the one hand and indigenous adaptations of human practices to new technologies on the other, we should expect a tremendous time lag between what actually happens and official changes in governance in response.

These challenging comments ushered in a discussion of the likely state of political processes and governance in the Beyond Cyberspace era. For convenience, the discussion is organized under three main topics below.

National Sovereignty

Beyond Cyberspace participants believe that, for a number of reasons, ubiquitous networked IT is likely to undermine the sovereignty of traditional nation states. For example, national governments will not be able to control information. Further, their grip on taxation will be weakened because people will conduct net-based transactions from the most advantageous sites. Likewise, no nation on its own can protect the intellectual property of its citizens or its corporations. The previously noted internationalization of markets and the fluidity of the labor force (including virtual and actual migration) further contribute to the marginalization of the nation state.

At the same time, transnational entities are emerging with which nation states have to share de facto power. These include large multinational corporations (e.g., telecommunications companies and financial service providers), nongovernmental organizations (e.g., WTO, IMF, The World Bank, WIPO) and intergovernmental organizations or regional alliances (e.g., the European Union, NAFTA). While ubiquitous networked IT provides the foundation for a global economy and a boundaryless labor force, it generates at the same time a demand for transnational bodies within which disputes can be settled, fair

practices negotiated, and laws harmonized. Coming to constructive terms with the declining importance of national sovereignty and creating effective transnational entities will be a major challenge in the not too distant future. The interplay between NGOs and formal national governance will be worth tracking.

Government@Home

It appears that some of the international trends noted above, reflecting a weakened ability to control in areas heavily influenced by IT, are also likely to marginalize the role of government at home. IT-enabled fluidity and fast-paced changes in markets and financial systems (e.g., disintermediated trading, microtransactions) contrast sharply with the pace at which oversight bodies (e.g., the SEC) move. More generally, old rules and procedures are poorly suited to new Beyond Cyberspace business models. Regulatory agencies in particular are especially at risk of not keeping up with these rapid developments.

A second source of marginalization of the role of government at home is reflected in trends toward privatization. Except for core processes of government (e.g., security, law), alternative sources are increasingly being used to provide services formerly administered by government agencies (e.g., transportation, postal service). In a growing number of arenas, government chiefly serves as a transfer agent (moving funds, redistributing wealth); but such functions too could largely be automated and/or outsourced.

On the other hand, following lessons learned by corporate America, government agencies in the US are already attempting to restructure themselves to take better advantages of the capabilities of digital media not only to make internal operations more efficient but also to create direct relationships with their clients and other stakeholders in their business processes. Disintermediation and one-stop network-based access to multiple government services could create performance improvements in the functions they retain. Further, if government agencies learn from the corporate world, they may design their IT-embedded services to provide feedback of the sort that will permit real-time assessment and improvement of ongoing functions. It should also be possible to make varied sorts of government-collected information much more accessible to citizens in the ubiquitously networked nation.

A final question concerned the role of government in innovation. In the past, high-technology R&D was largely the product of government sponsored efforts. At present research laboratories and research institutions with Ph.D-level

staffs generating ideas and experiments are being outpaced in IT innovation by small ventures and projects led by relatively junior staff. Given the rate of technological change, very large projects with long lead times are much less viable than large numbers of small experiments that can be rapidly carried out. It is worth asking what new models of successful innovation will prevail in the Beyond Cyberspace world and what roles, if any, the government should play in engendering or sustaining them.

Electoral Politics

Already in the US there is pressure for "e-voting," and it is bound to become a reality sooner or later.[10] Well within the time frame set out for this exercise the technology will have been perfected to solve authentication problems and prevent fraud and duplication. Beyond Cyberspace participants therefore attempted to probe the potential consequences of any-place any-time voting.

Ubiquitous availability of voting mechanisms would challenge the rationale for representative rather than direct democracy. Online voting is generally favored on grounds that it will enable greater citizen participation in electoral processes. On the other hand, it is not clear that reducing the transaction costs involved in voting would overcome voter apathy; in contrast, some group members suggested that decontextualized e-voting might actually increase apathy. A second concern had to do with volatility. With online voting, there would not be a need to wait two years, for instance, to elect a representative to Congress; it could be done much more frequently. However, reducing the time intervals could result in highly unstable governing bodies.

Similar themes were raised in relation to referenda. That is, e-voting would in principle permit most proposed measures to be approved by the general public; and the latency between proposal and passage (or rejection) of legislation could be vastly reduced. But government is supposed to be slow and measured, according to group members, while the e-voting scenarios envisioned here look like the "death of deliberation." Or, as one participant put it, "direct democracy could be as volatile as the stock market."

On the plus side, ubiquitous networked IT in the service of political processes would enable a complete census to be obtained much more often than every 10 years. Population and labor statistics, for instance, could be tracked in real time. Such procedures would permit significant improvements to be made in the

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[10] A recent primary election in Arizona allowed electronic voting. The precedent has been established, at least in a small, regional election.

quality of information collected by government to guide national, state and local policy decisions.

Education

The discussion of this domain began with the recognition that there are many interdependencies and feedback loops between education, work, and political processes. As an example, one participant pointed out that substantial numbers of Chinese students go to schools in the US for high-tech education and then remain here as part of the IT workforce; but they are likely to retain close social ties with members of their own culture in the US and at home, potentially influencing political processes in both countries.

It was nonetheless acknowledged that the education domain in the US presents a powerful array of institutional forces resisting transformation--perhaps more so than either work or government. Even given a ubiquitously wired world, Beyond Cyberspace participants were not able to agree on expected major changes or improvements to education or even clearly to delineate critical conflicts and tensions. What follows is an account of the group's deliberations.

Education Technologies and K-12 Education

Although considerable research attention has been given to educational software (for example, intelligent tutoring systems for algebra and geometry and simulated microworlds for discovery learning), very few effective educational software designs have been commercially developed and disseminated. Group members attributed this to the lack of a market-- schools don't have the dollars to spend on large volumes of high quality software, so vendors pursue the business and entertainment markets. Creating educational interfaces to generic software applications (e.g., database systems, GIS systems) surfaced as the path of least resistance to making good educational software accessible in US schools. Another option might be to motivate vendors to improve the instructional content of video games.

Improved interactive systems to support learning comprise a second potentially promising class of educational technologies. Future advances in human-computer interaction incorporating voice and gesture, for example, or high resolution imagery displays on the output side, might yield much more engaging learning experiences. Further, it will be possible to have biofeedback-driven learning technologies. For instance, computer systems can be developed to detect whether the learner is paying attention or whether the learner is

grasping the material and to respond accordingly. Since concentrated time on task is the best predictor of learning, these techniques could yield significant improvements in education. Again, however, such technologies have not yet generally been deployed outside of research contexts; their diffusion to educational settings would depend in part on the capability to produce them in high volume at low cost.

Distance Learning and Post-Secondary Education

Distance learning is already being offered by a growing number of traditional post-secondary educational institutions, although it is currently implemented in the main as a supplement to classroom-based programs. There are at least two noteworthy barriers to its more extensive deployment. One has to do with conflicts over the intellectual property rights to courseware between professors and the institutions in which they are based. Simply put, professors have no incentive to develop high quality courseware if they cannot receive royalties from it (in contrast, for instance, to the textbooks they write). Resolution of conflicts over patents resulting from university laboratory research could provide a model for overcoming this barrier.

A second and possibly more difficult obstacle has to do with the nature of traditional post-secondary education. While knowledge transfer is part of it, a lot of what is learned in school is socialization, achieved through peer group interactions. Distance learners are also at risk of being cut off from the formation of social networks whose value often persists long after the period of formal schooling. For these reasons, distance learning at least in the near term is likely to be most attractive to new demographic segments not previously served by traditional post-secondary educational institutions (e.g., single parents, disabled individuals, older adults, or working adults who would not want to go to a campus to attend classes after a full day at the office), and as a supplement to on-campus courses.

In any case, distance learning is not likely to drive innovative uses of IT in traditional post-secondary education. Rather, IT in these settings will most likely be used for distribution of course materials and provision of digital tools to on-campus learners (e.g., simulations, workbenches).

The Corporate Education Sector

Major IT-based innovations in teaching and learning are most likely to come from the corporate sector in the areas of professional education and life-long

learning. The world of work, as suggested earlier, is increasingly a world of knowledge work; and workers will face pressures to keep their knowledge base up to date. Thus the adult education market is growing, as evidenced by the rise of corporate universities--over 1000 of them belong to the professional society, Corporate Universities XChange.

IT-based techniques are particularly well-suited to the needs of this market for a number of reasons. For instance, participation in traditional classroom-based courses is very costly to employers and employees alike; usually the employer pays course fees but the employee has to take time off from work. Further, IT-based courses can be tailored by learners to suit their own needs (e.g., by stopping and repeating, by skipping over already learned material, by consulting FAQs as needed, by taking trial tests when ready, and so on).

This burgeoning market has already created big pay-offs for the corporate education sector and is beginning to attract competition from traditional universities. Although universities have not been as innovative or as flexible as the corporate sector in their course offerings for adult learners, in the past they had the advantage of being able to offer certification. Now the corporate sector is offering a growing number of certificate programs. One consequence of this competition is the heightened importance of branding (the name of the institution on the certificate). In technical programs, one participant noted, certificates from corporate universities (e.g., Lucent, Sun, Microsoft) sometimes carry more clout than those from similar programs in academic universities. Group members viewed the tension between corporate and academic education providers as a source of positive change.

Education in Developing Countries

Participants in the Beyond Cyberspace group believe that technical advances will yield small inexpensive IT devices that could be distributed on a one-per-child basis to spread appropriate education throughout developing countries. The aim would be to improve literacy and numeracy around the world at primary grade levels. One participant analogized the desired technology to a laptop with speak-and-spell (or speak-and-count) capabilities.

Such tools could enable organizations that are already engaged in assisting international development (e.g., the Peace Corps, UNDP, UNICEF, FAO) more readily to integrate education into their missions. International literacy and numeracy was viewed as the one area in which IT could stimulate major educational transformations within the time frame under discussion.

Crime

In the Beyond Cyberspace world, the domain of crime was seen as having much in common with the domain of business. For instance, it will likely rely on networks of distributed individuals whose activities span national boundaries.

Ubiquitous IT will significantly reduce physical crime for two kinds of reasons. First, cameras, sensors and other surveillance techniques will make physical activity extremely difficult to hide. Second, DNA tracing and other advanced analytic techniques (e.g., gathering physical evidence such as dirt or vegetation particles and analyzing them in relation to samples from a specific geographical location) will make it easier to identify anyone who has committed a physical crime.

An unintended consequence will be the shifting of crime to the IT world, where hiding evidence will be easier for those with considerable technical expertise. In the Beyond Cyberspace world, group members suggested that a new kind of extortion might become commonplace, with ransom being demanded for stolen data (e.g., credit card lists, company proprietary information). Digital retribution might also be on the rise, if disaffected individuals or groups are able to expunge important files, for instance, or generate viruses to avenge perceived wrongs. And new kinds of "insider crime" problems could arise if, because of virtual or actual migration, the IT workforce in US corporations includes large numbers of citizens of other countries.

An upsurge in such IT-enabled crime, in turn, would create new incentives for the development of some kinds of electronic goods and services. For instance, the demand for digital cash (vs. identifiable electronic funds transfers) should increase. Additionally, there should be greater demand for anonymizing services or software that masks or disguises network-based activity.

On the other hand, governments and international bodies would be expected to institute the collection, on a network-wide scale, of many kinds of time-stamped records of activity. In addition, the group envisioned the growth of "cyberforensics"; based on methods for gathering, typing and comparing stylistic elements in program samples, this field would aim to identify perpetrators of IT crime and providers of IT-based criminal services.

The group closed the discussion of this domain by noting that it had succeeded in not making encryption the focal point of its discussion of crime and detection in the information revolution.